CLAIMS

[c1] In a system for encoding digital video, the digital video comprising an anchor frame and at least one subsequent frame, the anchor frame and each subsequent frame comprising a plurality of pixel elements, a method of interframe coding, the method comprising:

converting the plurality of pixels of the anchor frame and each subsequent frame from pixel domain elements to the frequency domain elements, the frequency domain elements capable of being represented as DC elements and AC elements;

quantizing the frequency domain elements to emphasize those elements that are more sensitive to the human visual system and de-emphasize those elements that are less sensitive to the human visual system; and

determining the difference between each quantized frequency domain element of the anchor frame and corresponding quantized frequency domain elements of each subsequent frame.

[c2] 2. The method as set forth in Claim 1, wherein the act of converting utilizes discrete cosine transforms (DCT).

[c3] 3. The method as set forth in Claim 2, wherein the act of converting further utilizes discrete quadtree transforms (DQT).

[c4] 4. The method as set forth in Claim 1, wherein the act of quantizing further comprises weighting the elements using a frequency weighted mask.

[c5] 5. The method as set forth in Claim 4, wherein the act of quantizing further comprises utilizing a quantizer step function.

[c6] 6. The method as set forth in Claim 1, wherein four subsequent frames are compared against the anchor frame.

[c7] 7. The method as set forth in Claim 1, wherein only the difference between AC quantized frequency domain elements is determined.

[c8] 8. The method as set forth in Claim 1, further comprising grouping the plurality of pixel elements into 16x16 block sizes.

[c9] 9. The method as set forth in Claim 1, wherein the act of quantizing results in lossless frequency domain elements.

[c10] 10. The method as set forth in Claim 9, wherein act of quantizing results in lossy frequency domain elements.

[c11] 11. The method as set forth in Claim 1, further comprising expressing the subsequent frame as the difference between quantized frequency domain elements of the anchor frame and corresponding frequency domain elements of the subsequent frame.

[c12] 12. The method as set forth in Claim 1, further comprising serializing the quantized frequency domain elements.

[c13] 13. The method as set forth in Claim 12, further comprising variable length coding the serialized quantized frequency domain elements.

[c14] 14. In a system for encoding digital video, the digital video comprising a plurality of frames 1, 2, 3, ..., N, each frame comprising a plurality of pixel elements, a method of interframe coding, the method comprising:

converting the plurality of pixels of each frame from pixel elements to the frequency domain elements, the frequency domain elements capable of being represented in rows and columns;

quantizing the frequency domain elements to demphasize those elements that are more sensitive to the human visual system and de-emphasize those elements that are less sensitive to the human visual system; and

determining the difference between the quantized frequency domain element of the first frame and corresponding quantized frequency domain elements of the second frame; and

repeating the process of determining the difference between quantized frequency domain elements of successive frames such that quantized frequency domain elements of each frame are compared against quantized frequency domain elements of the frame immediately preceeding it.

[c15] 15. The method as set forth in Claim 14, further comprising expressing each frame 2 through N as the difference between quantized frequency domain elements of frames 2 through N and corresponding frequency domain elements of the frames 1 through N-1, respectively.

[c16] 16. The method as set forth in Claim 14, wherein the act of converting utilizes discrete cosine transforms (DCT).

[c17] 17. The method as set forth in Claim 16, wherein the act of converting further utilizes discrete quadtree transforms (DQT).

[c18] 18. The method as set forth in Claim 14, wherein the act of quantizing further comprises weighting the elements using a frequency weighted mask.

[c19] 19. The method as set forth in Claim 18, wherein the act of quantizing further comprises utilizing a quantizer step function.

[c20] 20. The method as set forth in Claim 14, wherein only the difference between AC quantized frequency domain elements is determined.

[c21] 21. The method as set forth in Claim 14, further comprising grouping the plurality of pixel elements into 16x16 block sizes.

[c22] 22. The method as set forth in Claim 14, wherein the act of determining results in lossless frequency domain elements.

[c23] 23. The method as set forth in Claim 14, wherein act of determining results in lossy frequency domain elements.

[c24] 24. The method as set forth in Claim 14, further comprising expressing the subsequent frame as the difference between quantized frequency domain elements of the anchor frame and corresponding frequency domain elements of the subsequent frame.

[c25] 25. The method as set forth in Claim 14, further comprising serializing the quantized frequency domain elements.

[c26] 26. The method as set forth in Claim 25, further comprising variable length coding the serialized quantized frequency domain elements.

[c27] 27. The method as set forth in Claim 26, wherein the variable length encoded serialized quantized frequency domain elements are Huffman encoded.

[c28] 28. In a system for encoding digital video, the digital video comprising an anchor frame and at least one subsequent frame, the anchor frame and each subsequent frame comprising a plurality of pixel elements, an apparatus configured for interframe coding, the method comprising:

means for converting the plurality of pixels of the anchor frame and each subsequent frame from pixel domain elements to the frequency domain elements, the frequency domain elements capable of being represented as DC elements and AC elements;

means for quantizing the frequency domain elements to emphasize those elements that are more sensitive to the human visual system and de-emphasize those elements that are less sensitive to the human visual system; and

means for determining the difference between each quantized frequency domain element of the anchor frame and corresponding quantized frequency domain elements of each subsequent frame.

[c29] 29. The apparatus as set forth in Claim 28, wherein the means for converting utilizes discrete cosine transforms (DCT).

[c30] 30. The apparatus as set forth in Claim 29, wherein the means for converting further utilizes discrete quadtree transforms (DQT).

[c31] 31. The apparatus as set forth in Claim 28, wherein the means for quantizing further comprises weighting the elements using a frequency weighted mask.

[c32] 32. The apparatus as set forth in Claim 31, wherein the means for quantizing further comprises utilizing a quantizer step function.

[c33] 33. The apparatus as set forth in Claim 28, wherein four subsequent frames are compared against the anchor frame.

[c34] 34. The apparatus as set forth in Claim 28, wherein the means for determining only determines the difference between AC quantized frequency domain elements is determined.

[c35] 35. The apparatus as set forth in Claim 28, further comprising means for grouping the plurality of pixel elements into 16x16 block sizes.

[c36] 36. The apparatus as set forth in Claim 28, wherein the means for quantizing results in lossless frequency domain elements.

[c37] 37. The apparatus as set forth in Claim 36, wherein the means for quantizing results in lossy frequency domain elements.

[c38] 38. The apparatus as set forth in Claim 28, further comprising means for expressing the subsequent frame as the difference between quantized frequency domain elements of the anchor frame and corresponding frequency domain elements of the subsequent frame.

[c39] 39. The apparatus as set forth in Claim 28, further comprising means for serializing the quantized frequency domain elements.

[c40] 40. The method as set forth in Claim 39, further comprising means for variable length coding the serialized quantized frequency domain elements.

[c41] 41. In a system for encoding digital video, the digital video comprising a plurality of frames 1, 2, 3, ..., N, each frame comprising a plurality of pixel elements, a method of interframe coding, the apparatus comprising:

means for converting the plurality of pixels of each frame from pixel elements to the frequency domain elements, the frequency domain elements capable of being represented in rows and columns;

means for quantizing the frequency domain elements to demphasize those elements that are more sensitive to the human visual system and de-emphasize those elements that are less sensitive to the human visual system; and

means for determining the difference between the quantized frequency domain element of the first frame and corresponding quantized frequency domain elements of the second frame; and

means for repeating the process of determining the difference between quantized frequency domain elements of successive frames such that quantized frequency domain elements of each frame are compared against quantized frequency domain elements of the frame immediately preceeding it.

[c42] 42. The apparatus as set forth in Claim 41, further comprising means for expressing each frame 2 through N as the difference between quantized frequency domain elements of frames 2 through N and corresponding frequency domain elements of the frames 1 through N-1, respectively.

[c43] 43. The apparatus as set forth in Claim 41, further comprising means for expressing the subsequent frame as the difference between quantized frequency domain elements of the anchor frame and corresponding frequency domain elements of the subsequent frame.

44. In a system for encoding digital video, the digital video comprising a plurality of frames 1, 2, 3, ..., N, each frame comprising a plurality of pixel elements, a method of interframe coding, the apparatus comprising:

a DCT/DQT transformer configured to convert the plurality of pixels of each frame from pixel elements to the frequency domain elements, the frequency domain elements capable of being represented in rows and columns;

a quantizer connected to the transformer configured to quantize the frequency domain elements to demphasize those elements that are more sensitive to the human visual system and de-emphasize those elements that are less sensitive to the human visual system; and

a delta coder connected to the quantizer configured to determine the difference between the quantized frequency domain element of the first frame and corresponding quantized frequency domain elements of the second frame, and repeating the process of determining the difference between quantized frequency domain elements of successive frames such that quantized frequency domain elements of each frame are compared against quantized frequency domain elements of the frame immediately preceeding it.

45. The apparatus as set forth in Claim 44, wherein only the difference between AC quantized frequency domain elements is determined.

46. The apparatus as set forth in Claim 44, further comprising a block size assignment configured to group the plurality of pixel elements into variable block sizes.

47. The apparatus as set forth in Claim 44, wherein the delta coder produces lossless frequency domain elements.

48. The apparatus as set forth in Claim 44, wherein delta coder produces lossy frequency domain elements.

49. The apparatus as set forth in Claim 44, further comprising a serializer connected to the quantizer configured to receive the quantized frequency domain elements and resequence the quantized frequency domain elements.

50. The method as set forth in Claim 49, further comprising a variable length coder connected to the serializer configured to variable length encode the quantized frequency domain elements.